asteroids has brought out some important facts. For this and other reasons, M. Tisserand thinks that the search for them should be continued. The calculations required to furnish elements and ephemerides are certainly formidable, but they could be divided among several scientific establishments. The Bureau des Longitudes is willing to play an onerous part. We hope that sufficient resources will be accorded to it to allow this extremely useful work to be carried on. RICHARD A. GREGORY.

SOLUTIONS.[1]

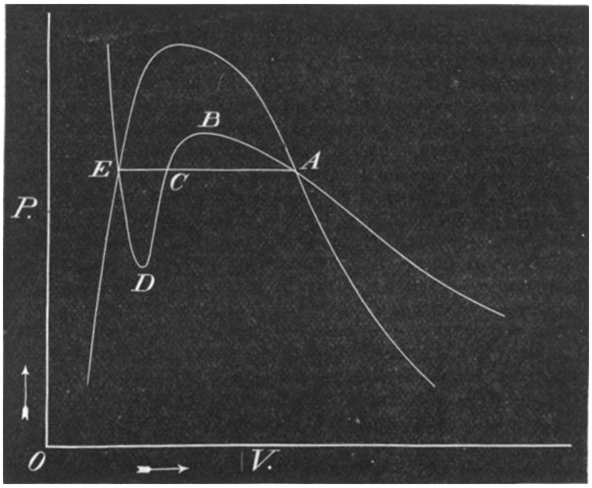
THE brilliant presidential address of Prof. Orme Masson at the Chemical Section of the Australasian Association for the Advancement of Science marks a distinct advance in our ideas of solution. The analogy between the behaviour of a liquid and its vapour in presence of each other and of a pair of solvents capable of mutual solution is so striking as to carry conviction. The resemblance of the liquid-vapour curve, with its apex at the critical point, to the solubility curve, with its apex at the critical solution point, appears to me to prove beyond cavil that the two phenomena are essentially of the same nature.

There are two other phenomena, which, it appears to me, are made clear by the ideas of Prof. Masson. The first of these has reference to supersaturated solutions. The curves (published in NATURE, February 12, p. 348) showing the analogy between liquid-gas and solution curves, are isobaric curves, or, more correctly, they represent the terminations of isobaric curves in the region of mixtures, where, on the one hand, a liquid exists in presence of its vapour, and, on the other, one solvent in presence of another (for both solvents play the part of dissolved substances, as well as of solvents). M. Alexéeff's data are not sufficient to permit of the construction of a curve representing a similar region mapped out by the termination of isothermal lines. But it is obvious that it would be possible to determine osmotic pressures of various mixtures by the freezing-point method, and so to construct isothermal curves for such mixtures of solvents. And there can be no reasonable doubt that, as the isobaric curves of liquid-gas and of solvent-solvent display so close an analogy, the isothermal curves would also closely resemble each other.

Granting, then, that this is the case, we may construct an imaginary isothermal curve on the model of the curve for alcohol published in the Phil. Trans. by Dr. Sydney Young and myself. Now, in one series of papers on the liquid-gas relations, we showed that with constant volume pressure is a linear function of temperature; and we were thus able to calculate approximately the pressures and volumes for any isothermal representing the continuous transition from the gaseous to the liquid state (see *Phil. Mag.*, 1887, vol. xxiii. p. 435). It would be interesting to ascertain whether, if concentration be kept constant, osmotic pressure would also show itself to be a linear function of temperature. But, this apart, it appears in the highest degree probable that there should also exist, in theory at least, a continuous transition from solvent to solvent, the representation of which would be a continuous curve. In such a case, on increasing the concentration of the solution by eliminating one solvent, the other solvent should not separate visibly, but the two should remain mixed until one solvent has been entirely removed. The accompanying diagram will make this clear. The sinuous curve ABCDE may represent either continuous change from gas to liquid along an isothermal on decrease of volume, or it may represent a similar continuous change from saturated solution to dissolved substance on increase of concentration.

Mr. Aitken's experiments on the cooling of air containing water-vapour have shown us that it is possible to realize a portion of the curve AB; the phenomenon of "boiling with bumping" constitutes a practical realization of a portion of the curve DE; and we may profitably inquire what conditions determine such unstable states with solvent and solvent.

Regarding the portion of the curve AB, I think that no reasonable doubt can be entertained. It precisely corresponds to the condition of supersaturation. In the liquid-gas curve, the volume is decreased at constant temperature without separation of liquid; in the solvent-solvent curve the concentration is increased without separation of the solvents. Dr. Nicol has shown that it is possible to dissolve dry sodium sulphate in a saturated solution of sodium sulphate to a very considerable extent without inducing crystallization; and here we have a realization of the unstable portion of the curve AB. In the gas-liquid curve pressure falls with formation of a shower of drops; in the solvent-solvent curve crystallization ensues, and the solvents separate. The phenomena are, however, not completely analogous; the complete analogy would be if the temperature were so low that the substance in the liquid-gas couple were to separate in the solid, not in the liquid, state. This, so far as I am aware, has not been experimentally realized, but one sees no reason why it should not be possible.



I have some hesitation in offering speculations as to the state of matter at the portion of the continuous curve DE. It may be that it corresponds to a syrupy or viscous state. Cane-sugar at a moderate temperature dissolves water; indeed it is possible to obtain a solution of 1 per cent. of water in molten cane-sugar. And such a solution, if quickly cooled, remains a syrup. But it can be induced to crystallize by the presence of crystals. Thus, in such a mixture of sugar and water, a few grains of crystalline sugar cause the whole mass to crystallize, and water saturated with sugar and sugar separate into two layers. Here, again, a complete analogy fails us, for it is a solid which separates. As we know nothing of the osmotic pressure of a syrup, the analogy is a defective one; but it is probable that a dilute solution of sugar would pass continuously into a syrup of pure sugar by evaporation of the solvent, and analogy would lead to the supposition that the syrup coincides with the unstable state of the liquid. I would, therefore, offer the analogy between the syrupy and the supercooled states as a tentative one: it lacks foundation in both cases.

One point remains to be mentioned. I have for the

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[1] "Some Suggestions regarding Solutions." By William Ramsay, Ph.D., F.R.S., Professor of Chemistry in University College, London. Read before the Royal Society on Thursday, March 5.

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past nine months, in conjunction with Mr. Edgar Perman, been determining the adiabatic relations for liquid and gaseous ether: the rise of pressure and temperature when volume is decreased without escape of heat. It is obvious that similar relations are determinable for solutions, and probably with much greater facility. M. Alexéeff has made some measurements which might be utilized for this purpose; but they are far too few in number, and, moreover, the necessary data as regards osmotic pressure are wholly wanting. It would be possible, by a series of differential experiments, to ascertain the evolution of heat on increasing concentration, and so to arrive at a knowledge of the specific heats of the solution at constant osmotic pressure, corresponding to the idea of specific heats at constant pressure; and also of specific heats at constant concentration, corresponding to specific heats at constant volume. I do not know whether such researches would yield as accurate results as those we are at present carrying out, but they are at least well worthy of attention.

THE SCIENCE COLLECTIONS.

We give below the latest Parliamentary proceedings relating to this question:—

April 16.—Mr. Mundella asked the First Lord of the Treasury whether, in proposing to give the large plot of ground opposite the Normal School of Science at South Kensington for a Gallery of British Art, the Government had fully considered the difficulties of placing an art gallery under an independent management between portions of the Science School and the science collections of the Science and Art Department; and whether the Government would appoint a small committee to report on the matter.

Mr. W. H. Smith—In assigning as a site or a Gallery of British Art the plot of ground opposite the Royal College of Science, the Government have not overlooked the requirements, immediate or prospective, of the Science and Art Department, either in respect of its science collections or in respect of the additional accommodation required for the College of Science. For the science collections there will be available, part at once and part within a year or two, a continuous range of galleries, consisting of the present southern, western, and eastern galleries, and the cross gallery which is about to be constructed between the western and eastern galleries, thus affording more than the amount of accommodation which the committee of 1889 considered to be necessary. Over and above this accommodation, Government has at disposal more than three acres of vacant land facing the Imperial Institute, and considerable areas besides to the south of the present southern galleries. A portion of these vacant lands can be utilized for the extension of the College of Science and for future growth of the science collections. Additions to the College of Science must in any case take the form of a separate building, divided from the present building by Exhibition Road; and as access to the lands mentioned above from Exhibition Road will be secured by means of a corridor, the interposition of the Gallery of British Art need have no more serious effect than to increase by some 60 yards (which will be under cover) the distance between the two portions of the Science College. As the Art Gallery will be a distinct and separate building, the fact that it will be under different management need cause no greater difficulty than does the fact that the Natural History Museum is under a different management from that of the adjoining science galleries.

April 20.—Sir H. Roscoe asked the First Lord of the Treasury whether he would have sketch plans prepared and placed in the Library, showing the relative positions of the existing science schools and science museums, the proposed buildings for the same purposes, and the proposed gallery of modern art, on the land at South Kensington.

The Chancellor of the Exchequer—As no definite scheme has yet been framed, it would be impossible to show exactly the appropriation of land now vacant, but I can promise the hon. member a ground plan, showing what land is available for further science buildings.

Sir H. Roscoe asked the right hon. gentleman whether he would give an assurance that the final step would not be taken in the appropriation of the land until after hon. members had had some opportunity of inspecting the plan.

The Chancellor of the Exchequer—The position of the matter is this. The House knows of the very generous offer that has been made of £80,000 to erect a building. A great deal of necessary and unavoidable delay has taken place, and I think it would be unwise to risk the failure of that generous gift by any further delay. Therefore, I am unwilling to pledge myself to any further delay, but I can assure my hon. friend that every security will be given to gentlemen interested in science that their wishes shall be met as far as possible.

There are a few more questions which might be asked, such as the following:—

1. Did the generous donor of the £80,000 know when the site was chosen that its employment for an art gallery interfered with its contemplated and natural use in relation to the buildings adjacent to it?
2. Are there no other sites, including one in Kensington Gardens, which would equally satisfy the donor, and not be liable to the objections so widely raised against the proposed one?
3. Has Mr. Goschen from first to last made any inquiry whatever as to whether there were any objections to the proposed employment of the site?
4. Has the Science and Art Department been asked its opinion, or have the professors of the College been consulted?

It would seem, indeed, that here we have another instance of the way in which Government arrangements in relation to science are made without knowledge.

NOTES.

The Council of the British Association for the Advancement of Science has resolved to nominate as President of the Association for next year Mr. Archibald Geikie, F.R.S., Director-General of the Geological Survey. The meeting will be held in Edinburgh.

On Tuesday next (April 28) Dr. E. E. Klein, F.R.S., will begin at the Royal Institution a course of three lectures on Bacteria: their nature and functions (the Tyndall Lectures); and Mr. H. Graham Harris will on Saturday (May 9) begin a course of three lectures on the artificial production of cold.

The Royal Naval Exhibition will be opened by the Prince of Wales, on behalf of the Queen, on Saturday, May 2.

The following cutting from the *Sydney Morning Herald*—date not stated—has been sent to us for publication:—"The barque *Killarney* had both a stormy and an extraordinary passage, in one portion of which she stood a good chance of being placed on the list of missing vessels. At 9 p.m. on October 15, 1890, when the barque was 50 miles east of Kent's Group, there was a sudden shift of wind during a heavy thunderstorm. In the midst of a heavy clap a bulky mass was heard to fall into the sea about 200 yards from the vessel. The roar of it coming through the air was quite distinct from that of the thunder, and spray was thrown fully 40 feet high on its reaching the water. The falling mass is believed to have been a meteor."

The Wolsingham Observatory Circular No. 31 states that a new variable star was found on March 2 at 4h. 26m. 4s. +65° 53′

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